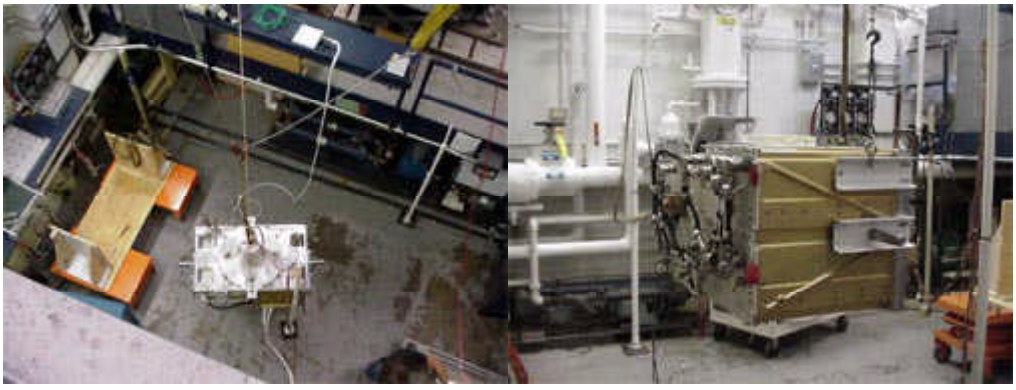
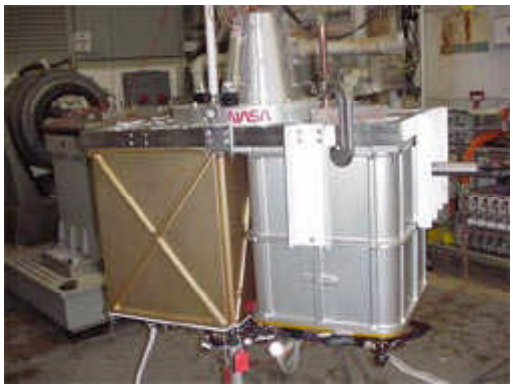
Microgravity Emissions Laboratory Developed

The Microgravity Emissions Laboratory (MEL) was developed for the support, simulation, and verification of the International Space Station microgravity environment. The MEL utilizes an inertial measurement system using acceleration emissions generated by various operating components of the space station. These emissions, if too large, could hinder the science performed on the space station by disturbing the microgravity environment.

Typical test components are disk drives, pumps, motors, solenoids, fans, and cameras. These components will produce inertial forces, which disturb the microgravity on-orbit station environment. These components, usually housed within a station rack, must meet acceleration limits imposed at the rack interface for minimizing the onboard station-operating environment. The NASA Glenn Research Center developed this one-of-a-kind laboratory for testing components and, eventually, rack-level configurations. The MEL approach is to measure the component's generated inertial forces. This force is a product of the full diagonal mass matrix including the test setup (the center of gravity, mass moment of inertia, and weight) and the resolved diagonal rigid-body acceleration determined from measurements using the 10 apparatus accelerometers. The mass matrix can be test derived. The bifilar torsional pendulum method is used to measure the moment of inertia for the test component.



Left: View from above the Physics of Colloids in Space MEL testing in progress. Right: Mass moment of inertia test setup.



MEL testing of the Physics of Colloids in Space experiment.

MEL is a low-frequency (0.15- to 0.4-Hz) isolator. The lateral frequencies are established with the pendulum, and the vertical mode is lowered with a zero-rate spring mechanism. This mechanism reduces the system's ver-tical frequencies to approximately 0.3 Hz. It suspends the measurement apparatus with the attached test unit by a long cable. The system allows the test article to float freely similar to a zero-g condition above 1 Hz. The measured motion of the rigid body is characterized through the MEL test, and the accelerometer data is postprocessed to calculate the rigid-body component forces and moments at the center of gravity/interface of the test unit.

MEL was developed for the Fluids and Combustion Facility through Glenn's Microgravity Sciences Division. It is located in Glenn's Structural Dynamics Laboratory. Engineering models of the Fluids and Combustion Facility's Optics Bench and Air Thermal Control Unit were tested in fiscal year 2001. Testing can be requested by using the MEL Web site (http://www.grc.nasa.gov/WWW/MAEL/).

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